

CLAIMS

1 – A multiple gear ratio transmission device, adapted to connect an engine to a load such as a motor vehicle, comprising:

- 5 – an upper shaft (2),
- a lower shaft (4),
- connected to each other by at least two power paths (8a, 8b), at least one of which defines at least two gear ratios, the gear ratios differing from one path to another between the upper shaft and
- 10 the lower shaft,
- on each power path, selective activators (18a, 18b; 118a, 218a, 318a, 118b, 218b, 318b) to establish each determined gear ratio and to deactivate in terms of power transmission at least one path other than the path defining the aforementioned determined gear
- 15 ratio,

characterised in that:

- the connection between the upper shaft (2) and a respective input unit (9a, 9b) of each of the power paths (8a, 8b) is permanent; and
- 20 – the selective activators are of a gradual type and/or able to adapt the speed of the engine to the speed of the load.

2 – A device according to claim 1, characterised in that the selective activators are wet multi-disc friction couplings (118a, 218a, 318a ; 118b, 218b, 318b).

- 25 3 – A device according to claim 1 or 2, characterised in that at least some of the selective activators are brakes (118a, 318a, 118b, 218b) that selectively connect a reaction member to a housing (22) of the transmission device.

- 4 – A device according to any one of claims 1 to 3, characterised in
- 30 that each power path (8a, 8b) is kinematically independent and comprises an output unit (11a, 11b) permanently connected to the lower shaft (4).

5 – A device according to any one of claims 1 to 4, characterised in that the two power paths (8a, 8b) are approximately identical and are capable of obtaining between their input unit (9a, 9b) and their output unit

(11a, 11b) identical local gear ratios, but are connected to the upper shaft (2) and/or the lower shaft (4) with a different transfer ratio.

6 – A device according to any one of claims 1 to 5, characterised in that each power path (8a, 8b) is capable of a local direct drive gear ratio.

5 7 – A device according to any one of claims 1 to 6, characterised in that each selective activator can be placed in a neutral state, so that each gear ratio of a power path is obtained by placing a single activator in an activated state, whilst the power path is placed in neutral when all of the selective activators of the power path are in a neutral state.

10 8 – A device according to any one of claims 1 to 7, characterised in that at least one said power path (8a, 8b) comprises subpaths, each corresponding to a respective local gear ratio, which are mounted mechanically in parallel between the input unit (9a, 9b) and the output unit (11a, 11b).

15 9 – A device according to any one of claims 1 to 8, characterised in that at least one of the power paths comprises at least one planetary gear train (123a, 223a; 123b, 223b).

20 10 – A device according to any one of claims 1 to 8, characterised in that at least one (8b) of the power paths comprises first and second planetary gear trains (123b, 223b), respectively comprising:

- first and second planet carriers (124b, 224b), in which the planet pinions are mounted in pairs (128i, 128e; 228i, 228e) in series,
- first and second sun gears (126b, 226b),
- first and second ring gears (127b, 227b),

25 in that:

- the two ring gears (127b, 227b) are attached to the output unit (11b),
- the first planet carrier (124b) and the second sun gear (226b) are attached to the input unit (9b),

30 and in that the selective activators comprise:

- a brake (118b) for the first sun gear (126b),
- a brake (218b) for the second planet carrier (224b),
- a direct drive clutch (318b).

11 - A device according to any one of claims 1 to 8 or 10, characterised in that at least one (8a) of the power paths comprises first and second planetary gear trains (123a, 223a), respectively comprising:

- first and second planet carriers (124a, 224a),
- 5 - first and second sun gears (126a, 226a),
- first and second ring gears (127a, 227a),

in that:

- the first ring gear (127a) and the second planet carrier (224a) are attached to the output unit (11a),
- 10 - the first planet carrier (124a) and the second sun gear (226a) are attached to the input unit (9a),

and in that the selective activators comprise:

- a brake (118a) for the second ring gear (227a),
- a brake (318a) for the first sun gear (126a),
- 15 - a direct drive clutch (218a).

12 - A device according to any one of claims 1 to 11, characterised in that at least one of the input units (9a) and output units (11a) on each path (8a) is located in an intermediate position between the spatial ends of the path.

20 13 - A device according to any one of claims 1 to 11, characterised in that the output unit and the input unit on each path are axially adjacent, in particular at one spatial end of the path.

 14 - A device according to any one of claims 1 to 13, characterised in that it comprises controls (17) capable of synchronising the gradual placing
25 of a selective activator in a neutral state with the gradual placing of another selective activator in an activated state.